for device **12** (e.g., drive current magnitude and phase for each coil **42** and each optional supplemental coil **42'**).

[0059] After characterization and calibration operations (blocks **102**, **104**, and **106**) are complete, device **12** is used in charging one or more devices **24** in system **8**.

[0060] During the operations of block **108**, for example, coil coupling is measured between each coil **42** in device **12** and each power receiving device coil **48** in the device(s) **24** that is present on the charging surface of device **12**. Coil coupling is measured using measurement circuits such as circuits **41** and/or **43** and/or other circuitry in system **8**. Coil coupling measurements and/or other measurements made with circuitry **41** and/or **43** indicate where each power receiving device and its coil(s) **48** is located on device **12**. Information on which types of power receiving devices **24** are present and desired power transmission levels for each device is obtained using wireless communications. For example, each device **24** can send a receiver identifier or other information indicative of device type such as cellular telephone, watch, wireless headphone case, etc. and/or power level adjustment commands and/or other information indicative of desired power transmission settings to device **12** using in-band and/or out-of-band communications. In some configurations, device type information is obtained by processing measurements from measurement circuitry **41** (e.g., patterns of measured impedance changes for coils **42** across the charging surface, etc.).

[0061] The information obtained during the operations of block **108** and the characterization information stored in the look-up table or other data structure of block **106** are used during the operations of block **110**. In particular, control circuitry uses information on device type and/or other wireless power receiving device information, impedance measurements and other measurements made with circuitry **41** and/or circuitry **43** such as coil coupling measurements indicating how strongly each coil in device **12** is coupled to each device **24** and therefore the position of each device **24** on the charging surface of device **12**, information on desired power transmission levels, information on measured magnetic fields (e.g., real time magnetic field measurements made using one or more magnetic sensors **100**), and/or other information on the operating environment of system **8** in making appropriate selections for the phase, magnitude, and other attributes of the drive signals applied to the coils in device **12**. For example, when a receiving device such as a cellular telephone is coupled to multiple coils **42**, the coils **42** may be driven in phase as described in connection with FIG. **8**. When multiple devices **24** (e.g., cellular telephones) overlap multiple respective sets of coils **42**, the coils **42** in each set may be driven appropriately (e.g., in phase) to reduce ambient fields and the sets of coils may each be provided with appropriate signals (e.g., some of the sets may be driven in phase with each other and some of the sets may be driven out of phase with each other). In configurations with non-power-transmitting coils, drive signal phase and magnitude for coils **42** and the attributes of the drive signals applied to the non-power coils **42'** are adjusted to reduce ambient magnetic fields.

[0062] The foregoing is merely illustrative and various modifications can be made to the described embodiments. The foregoing embodiments may be implemented individually or in any combination.

What is claimed is:

1. A wireless power transmitting device configured to transmit wireless power to a wireless power receiving device having a wireless power receiving coil, comprising:

wireless power transmitting coils; and

control circuitry coupled to the wireless power transmitting coils that is configured to:

in response to placement of the wireless power receiving device on the wireless power transmitting device in a position where the wireless power receiving coil overlaps a first of the wireless power transmitting coils, reducing ambient magnetic fields by energizing at least a second of the wireless power transmitting coils that is not overlapped by the wireless power receiving coil to produce canceling magnetic fields that interact with magnetic fields produced by the first of the wireless power transmitting coils while transmitting the wireless power.

2. The wireless power transmitting device of claim **1**, wherein:

the wireless power transmitting device has a charging surface; and

the wireless power receiving coil is parallel to the charging surface when the wireless power receiving device is placed on the wireless power transmitting device.

3. The wireless power transmitting device of claim **1**, further comprising:

a magnetic shielding layer, wherein the wireless power transmitting coils each have terminals that pass through the magnetic shielding layer.

4. The wireless power transmitting device of claim **3**, further comprising:

non-power-transmitting coils formed from wires passing through the magnetic shielding layer that are configured to produce additional canceling magnetic fields that interact with the magnetic fields produced by the first of the wireless power transmitting coils.

5. The wireless power transmitting device of claim **1**, wherein the control circuitry comprises measurement circuitry configured to measure information associated with the wireless power receiving device.

6. The wireless power transmitting device of claim **5**, wherein:

the measurement circuitry is configured to measure magnetic coupling between at least two of the wireless power transmitting coils and the wireless power receiving device; and

the position of the wireless power receiving coil is determined using the measured magnetic coupling.

7. The wireless power transmitting device of claim **5**, wherein:

the measurement circuitry is configured to measure magnetic coupling between at least two of the wireless power transmitting coils and the wireless power receiving device; and

the control circuitry is configured to reduce the ambient magnetic fields while transmitting the wireless power by generating drive signals for at least two of the wireless power transmitting coils overlapping with the wireless power receiving coil.

8. The wireless power transmitting device of claim **7**, wherein the drive signals applied to the at least two of the wireless power transmitting coils overlapping with the wireless power receiving coil are in-phase drive signals.